

CLAIMS:

1. An handheld electronic device comprising:

a housing;

a first electromechanical transducer included in the housing;

5 an first foot, for making contact with an external surface on which the handheld electronic device is placed, said first foot being coupled to said first electromechanical transducer, said first foot comprising an asymmetric tread that establishes a direction of movement of the first foot when driven perpendicularly against the external surface by the first electromechanical transducer; and

10 an electrical drive circuit coupled to the first electromechanical transducer for supplying a drive signal to the first electromechanical transducer to cause the first electromechanical transducer to vibrate.

2. The handheld electronic device according to claim 1 wherein:

15 the first electromechanical transducer comprises a reciprocating mass, driven by a voice coil motor.

3. The handheld electronic device according to claim 1 wherein the

the first electromechanical transducer comprises:

20 a rotary electric motor; and

an unbalanced rotating mass coupled to and driven by the rotary electric motor.

4. The handheld electronic device according to claim 1 wherein:

25 the asymmetric tread is characterized by a sawtooth waveform profile.

5. The handheld electronic device according to claim 1 wherein:

the first electromechanical transducer is coupled to the housing by an
isolation member.

5 6. The handheld electronic device according to claim 1 wherein:

the first electromechanical transducer and the first foot are located at a first
corner of the handheld electronic device; and

the handheld electronic device further comprises:

a second electromechanical transducer coupled to a second foot

10 located at a second corner of the handheld electronic device;

a third electromechanical transducer coupled to a third foot located at
a third corner of the handheld electronic device; and

a fourth electromechanical transducer coupled to a fourth foot located
at a fourth corner of the handheld electronic device.

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7. The handheld electronic device according to claim 6 wherein:

the first, second, third and fourth feet have treads that are oriented to establish
directions of movement that are not radial with respect to a center of mass of the
handheld electronic device.

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8. The handheld electronic device according to claim 1 further comprising:

an accelerometer; and

a controller coupled to the accelerometer and to the electrical drive circuit.

9. The handheld electronic device according to claim 8 wherein the controller is programmed to:

read a user input specifying a type of event to be associated with a movement to be learned;

5 read a user input command commanding the controller to go into a learn mode;

in the learn mode, read the accelerometer in order to measure one or more movements of the handheld electronic device carried out by the user; and

thereafter, in response to detecting an event of the specified type
10 operate the electrical drive circuit in order to approximate the one or more movements of the handheld electronic device.

10. A handheld communication device comprising:

an electromechanical ambulation mechanism;

15 a drive circuit coupled to the electromechanical ambulation mechanism;

a controller coupled to the drive circuit;

a memory storing a control program, coupled to the controller; and

a transceiver coupled to the controller.

20 11. The handheld communication device according to claim 10 wherein:

the controller is programmed by the control program stored in the memory to:

operate the transceiver to receive a communication; and

in response to receiving the communication:

25 operate the drive circuit in order to drive the electromechanical ambulation mechanism.

12. The handheld communication device according to claim 10 wherein:

the memory also stores a plurality of movement instructions, each of which is associated with a particular type of communication; and

the controller is programmed by the control program stored in the memory to:

operate the transceiver to receive a communication;

access one of the movement instructions that is associated with the particular type of the received communication; and

operate the drive circuit according to the movement instructions associated with the particular type of the received communication,

10 whereby, in response to receiving communications, the handheld communication device moves in a distinctive way that identifies the type of received communication.

13. The handheld communication device according to claim 10 further comprising:

an accelerometer coupled to the controller;

wherein the controller is programmed to:

5 read a first a user input specifying a type of event that is to trigger a movement that is to be learned;

read a second user input commanding the controller to go into a learn mode;

10 in the learn mode, read the accelerometer in order to measure one or more movements of the handheld communication device performed by the user; and

thereafter, in response to detecting an event of the type specified by the user, operate the drive circuit in order to mimic the one or more movements of the handheld communication device performed by the user.

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14. A handheld audio device comprising:

a housing, said housing holding:

a controller;

at least one memory storing a control program for operating the

5 handheld audio device, said at least one memory coupled to the controller;

an audio system coupled to the controller;

an ambulation system comprising:

an electromechanical ambulation mechanism;

a first drive circuit coupled to the electromechanical ambulation

10 mechanism, and coupled to the controller;

wherein, the controller is programmed to drive the ambulation system

in response to audio processed by the audio system.

15. The handheld audio device according to claim 14, wherein:

15 said audio system comprises a loudspeaker, and a second drive circuit

coupled to the loudspeaker.

16. The handheld audio device according to claim 14 wherein:

the controller is programmed to digitally process digital audio to obtain

20 processed audio and drive the ambulation system according to the processed audio.

17. The handheld audio device according to claim 16 wherein:

the controller is programmed to process digital music with a beat detection

algorithm, in order to detect one or more beats, and operate the ambulation system

25 so as to change a movement of the handheld audio device in response to the one or

more beats.

18. The handheld audio device according to claim 14 wherein:
said audio system comprises a microphone; and
wherein the controller is programmed by the control program to:
process input audio signals received from the microphone to obtain
5 processed audio; and
operate the electromechanical ambulation mechanism according to
the processed audio.

19. The handheld audio device according to claim 18 wherein:
10 the controller is programmed to process input audio signals received from the microphone with a beat detection algorithm to detect one or more beats and operate the electromechanical ambulation mechanism to change a movement of the handheld audio device in response to the one or more beats.

15 20. A method of operating two devices in a wireless communication system, the method comprising:
in a first device, reading an accelerometer in order to measure one or more movements of the first device; and
transmitting information as to the one or more movements to a second device;
20 in the second device, receiving the information as to the one or more movements; and
driving one or more ambulation mechanism of the second device in order to move the second device according to the information as to the one or 25 more movements of the first device.

21. The method according to claim 20 wherein:

the information as to the one or more movements of the first device is transmitted via a cellular network.